Appendix F
Air Dispersion Modeling Protocol and DEQ E-mail Confirmation

McCormick, Rick/BOI

From: Kevin.Schilling@deq.idaho.gov
Sent: Tuesday, May 22, 2007 3:13 PM
To: McCormick, Rick/BOI
Subject: RE: Norsun Modeling Protocol

Rick,

The project emissions increases are all below applicable modeling thresholds. Therefore, modeling analyses are not necessary to adequately demonstrate compliance.

Please include a copy of this email with the application as documentation of DEQ concurrence that an air quality modeling assessment is not required for the proposed modification because the sum of all emissions increases are less than DEQ modeling thresholds.

Thank you,

Kevin Schilling
Stationary Source Air Modeling Coordinator
Idaho Department of Environmental Quality
208 373-0112

From: Rick.McCormick@CH2M.com [mailto:Rick.McCormick@CH2M.com]
Sent: Tuesday, May 22, 2007 2:16 PM
To: Kevin Schilling
Subject: Norsun Modeling Protocol

Kevin,

We verified that emission calculations for Norsun Food Group production increase. The emissions resulting for the proposed production increase are as stated in the modeling protocol.

The PM-10 emissions are below the modeling thresholds as stated in Table 1 of the *State of Idaho Air Quality Modeling Guideline*, dated 12/31/02. Therefore, we are requesting your approval that an air dispersion modeling analysis is not required for this Norsun permit modification.

Thank you for your assistance,

Rick McCormick, P.E.
Project Engineer
CH2M HILL - Boise
(208) 383-6457

Air Dispersion Modeling Protocol for Norsun Food Group, Inc. Permit Application Sugar City, Idaho

(15-dayPermit Construction Approval)

Prepared for:

Norsun Food Group, Inc.

Submitted to:

Idaho Department of Environmental Quality

April, 2007

Prepared By:

CH2MHILL

Project Background

Norsun Food Group, Inc. operates a cooked potato processing plant in Sugar City, Madison County, Idaho, approximately 28 miles northeast of Idaho Falls. The plant is in the process of preparing a 15-day permit modification for pre-permit construction approval. The plant would like to modify their existing Permit-to-Construct (PTC) by increasing the plant's potato production capability. The plant modification will consist of two primary changes. The first change will be to increase steam production by increasing the heat input rating of the existing 12.8 MMBtu/hr Clayton steam boiler to approximately 14.6 MMBtu/hr. The second change will be to replace the 12.0 MMBtu/hr Eclipse A-line oven in order to increase roasting production. The A-line oven roaster burners are currently using 6 burners and will be replaced by 4 burners which will result in a net decrease in emissions.

This air dispersion modeling protocol is being submitted to the Idaho Department of Environmental Quality (IDEQ) for approval prior to the initiation of the air quality modeling for the Norsun plant. This document summarizes the modeling methodology that will be used to evaluate the plant's impacts to air quality with respect to criteria and toxic air pollutants. It has been prepared based on the U.S. Environmental Protection Agency (EPA) *Guidelines on Air Quality Models* (GAQM), and the *State of Idaho Air Quality Modeling Guideline* (ID AQ-01, December 31, 2002).

Sources

Process Description

The Norsun plant consists of three separate processing lines, A and B which are nearly identical and provided various types of cut and cooked potato products, and C, which produces whole baked potatoes. The C-line process line was destroyed over a year ago from a lightning caused fired jumping across their circuit board. The plant operates the A and B process lines using natural gas exclusively. In addition, Norsun utilizes two ammonia-cooled freezers and precoolers to store their processed potatoes from the A-line and B-line.

The modeling analysis will first be performed using the increased boiler and decreased A-Line emissions. If necessary, all other existing emission sources, except those that will be considered trivial, will also be modeled. The emissions from the steam peeler, the Office (pulse) heater, two office 9200 heaters and the boiler room heater will be considered trivial and will not be included in the modeling analysis.

Normal operation of the plant does not include the release of ammonia from the pressure relief valves, and therefore no emissions will be estimated nor will any modeling be performed for ammonia. Pressure relief valves are only used once or twice a year and only if the freezers are not operating properly.

Stack Information

The emission sources, the boiler and the A combustion and drying line, for the modification are identified in Table 1. A plant layout showing the location of buildings and emissions sources is included in Figure 1.

Table 1						
Stack Parameters						
Stack Name	**Stack ID**	**Stack Height (m)**	**Diameter (m)**	**Flow Rate (m/s)**	**Temperature (K)**	**Notes***
Steam Boiler	STEAMBO	9.94	0.72	0.001	341.5	Rain Cap
A Line Combustion and Drying	ALINECD	10.08	0.23**	0.001	644.3	Rain Cap

Notes:
*Stacks with rain caps and horizontal stacks will be given flow rates of 0.001 m/s.
** The A Line Combustion is exhausted through a non-circular vent, 8 inch x 8 inch, the effective stack diameter was calculated.

Emission Controls

No emission controls are used to control criteria emissions from the plant.

Emissions Rates

Emission rates increases were calculated based on the change of capacity of each source included in this protocol. The particulate (PM_{10}), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Volatile Organic Carbon (VOC) pollutant emissions, by source, are shown in Tables 2 and 3.

TAP emissions have been estimated and compared to the screening emission limit (EL) as specified in the regulation (IDAPA 58.01.01 585 and 586). Modeling will be performed for those TAPs whose emission change estimate is greater than the EL. Initial TAP emission estimates show all emissions below the emission screening limit.

Table 2					
Annual Emission Rates in tons/year					
Stack ID	PM_{10}	NOx	SO_2	CO	VOC
STEAMBO	0.059	0.005	0.773	0.649	0.043
ALINECD	0.252	-0.006	-0.945	-0.794	-0.052
Net Change	0.311	-0.001	-0.172	-0.144	-0.009

Table 3					
Hourly Emission Rates in pounds/hour					
Stack ID	PM_{10}	NOx	SO_2	CO	VOC
STEAMBO	0.013	0.0011	0.176	0.148	0.010
ALINECD	0.058	-0.0013	-0.216	-0.181	-0.012
Net Change	0.071	-0.0002	-0.039	-0.033	-0.002

Regulatory Review

Standards and Criteria Levels

Table 4 summarizes applicable criteria including:

- Significant contribution levels (SCL),
- National Ambient Air Quality Standards (NAAQS).

Table 4				
Regulatory Standards and Significance Levels				
Pollutant	Averaging Period	NAAQS		SCL
		µg/m³	ppm	(µg/m³)
CO	8-Hour	10,000	9	500
	1-Hour	40,000	35	2,000
NO_2	Annual	100	0.053	1
PM_{10}	Annual	--	--	1
	24-Hour	150	--	5
$PM_{2.5}$	Annual	15	--	--
	24-Hour	35	--	--
SO_2	Annual	80	0.03	1
	24-Hour	365	0.14	5
	3-Hour	1300	0.5	25

Modeled concentrations will be compared to the applicable Idaho significant contribution levels (SCL) shown in Table 5. If the predicted impacts are not significant (that is, less than the SCL), the modeling is complete for that pollutant under that averaging time. If impacts are significant, a more refined analysis will be conducted for demonstration of compliance with the NAAQS. A description of the modeling methodology is presented below.

Dispersion Model

The EPA-approved AERMOD (Version 07026) model will be used. AERMOD is a steady-state plume model that simulates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. This model is recommended for short range (< 50 km) dispersion from the source. The model incorporates the ISC Prime algorithm for modeling building downwash, which was developed to address deficiencies in the downwash algorithm previously used in the ISC model. AERMOD is designed to accept input data prepared by two specific pre-processor programs, AERMET and AERMAP. IDEQ adopted the federal mandate requiring the use of the AERMOD dispersion model for permit applications on November 9, 2006. AERMOD will be run with the following options.

- Regulatory default options,
- Direction-specific building downwash,
- Actual receptor elevations and hill height scales,
- Complex/intermediate terrain algorithms.

Building Downwash

Building influences on stacks are considered by incorporating the updated EPA Building Profile Input Program [BPIP-Prime]. The stack heights used in the dispersion modeling will be the actual stack height or Good Engineering Practice (GEP) stack height, whichever is less.

Meteorological Data

AERMET modeling files will be provided by IDEQ for Pocatello, Idaho. The site characteristics used by IDEQ when processing AERMET will be submitted with the final modeling report. These characteristics will include albedo, surface roughness, and Bowen ratio for each season and each 30-degree wind direction sector.

AERMET accepts National Weather Service (NWS) 1-hour surface observations, NWS twice-daily upper air soundings, and data from an on-site meteorological measurement system. These data are processed in three steps. The first step extracts data from the archive data files and performs various quality assessment checks. The second step merges all available data (both NWS and on-site). These merged data are stored together in a single file. The third step reads the merged meteorological data and estimates the boundary layer parameters needed by AERMOD. AERMET writes two files for input to AERMOD: a file of hourly boundary layer parameter estimates and a file of multiple-level (when the data are available) observations of wind speed and direction, temperature, and standard deviation of the fluctuating components of the wind direction.

For PM_{10} modeling a combined data file for all five years will be used according to IDEQ request. For all other pollutants a data file for each year will be used.

Ambient Conditions

Background concentrations for this facility will be provided by IDEQ. Table 5 will be completed and included with the final report.

Table 5					
Background Criteria Pollutant Concentrations (µg/m³)					
Pollutant	1-hr	3-hr	8-hr	24-hr	Annual
NO_x					
SO_2					
PM_{10}					
CO					

Receptors

The ambient air boundary will be the fenceline. The selection of receptors in AERMOD will be as follows:

- The first run will be a 500-meter coarse grid with a nested Cartesian grid of 100 meter-spaced receptors as follows:
  - The 100-meter grid will extend approximately 1 km around the plant.
  - The 500-meter grid will extend approximately 5 km,
  - Receptors will be placed at 25-meter intervals around the fenceline.
- A second run using a fine receptor grid will be centered on the point of maximum impact and re run using a 50 meter grid spacing, unless the initial maximum occurs on the fenceline.
-
- Receptor elevations will be calculated by AERMAP as described below.

AERMAP will be run to process terrain elevation data for all sources and receptors using 7.5 minute Digital Elevation Model (DEM) files prepared by the USGS. AERMAP first determines the base elevation at each source and receptor. For complex terrain situations, AERMOD captures the physics of dispersion and creates elevation data for the surrounding terrain identified by a parameter called hill height scale. AERMAP creates hill height scale by searching for the terrain height and location that has the greatest influence on dispersion for each individual source and receptor. Both the base elevation and hill height scale data are produced for each receptor by AERMAP as a file or files which can be directly accessed by AERMOD.

Preliminary Analysis

The preliminary analysis for each pollutant will be conducted as follows:

- If the predicted impacts are not significant (that is, less than the SCL) for each criteria pollutant, the modeling is complete for that pollutant under that averaging time.
- If impacts are significant, a more refined analysis, as described below, will be conducted.
- For NO_x, it will be initially assumed that all NO_x is converted to NO_2. If the resulting concentration exceeds the SCL, then the concentration will be multiplied by the default annual NO_2/NO_x ratio of 0.75 as suggested by EPA and compared to the SCL again. If the resulting concentrations still exceed the SCL, then a refined analysis will be conducted.
- Toxic pollutant impacts will be compared to the acceptable ambient concentrations for non-carcinogens or carcinogens, as applicable.

Refined Analyses – Criteria Pollutants

- Comparison to the Ambient Air Quality Standards
  - For pollutants with concentrations greater than the SCLs, the maximum concentration will be determined and compared to the NAAQS. This maximum concentration will include contributions from the plant, nearby sources, and ambient background concentrations. Background concentrations to be provided by IDEQ will be used to determine concentrations.
  - IDEQ will be contacted to identify nearby sources, if any, that need to be included in the analysis.

Output - Presentation of Results

The results of the air dispersion modeling analyses will be presented as follows:

- A description of modeling methodologies and input data,
- A summary of the results in tabular and, where appropriate, graphical form,
- Modeling files used by AERMOD will be provided with the application on compact disk,
- Any deviations from the methodology proposed in this protocol will be presented.

Attachment
Emissions XL Spreadsheet CD